

REMARKS

Applicants respectfully request reconsideration of the present application in view of the reasons which follow.

No claims are currently being amended. Claims 1, 3, 5, 6, 8 and 9 are pending in this application.

Examiner Interview

Applicants appreciate the courtesies extended by Examiner Jose Diaz in the personal interview of August 27, 2004. The substance of that interview is provided in the Interview Summary of that date, which is of record in the present application. The Cheung reference (EP 0 804 361 A2) was discussed during the interview. Applicants understand the Examiner's position regarding the phrase "little to none" in Cheung to mean in the range from zero to little.

Applicants argued that the claimed temperature range of claims 1 and 5 was not disclosed by Cheung, and that Cheung does not suggest temperature to be a "result-effective variable" for nitrogen incorporation into silicon-oxide based film. Examiner Dias suggested providing evidence of unexpected results.

Rejection under 35 U.S.C. § 103

Claims 1, 3, 5-6 and 8-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 0 840 361 A2 to Cheung et al. (hereafter "Cheung"). Applicants respectfully traverse this rejection for at least the following reasons.

The Office Action has not established a *prima facie* case of obviousness of the claims over Cheung, at least because Cheung does not suggest temperature as a result-effective variable for decreasing the nitrogen incorporation at the surface in a silicon-oxide-based film. In both independent claims 1 and 5, the silicon-oxide-based film is formed by using SiH₄ and N₂O as material gases at a reaction temperature of over 400 °C. The Office Action asserts

with regard to the claimed temperature range, that it would have been obvious over Cheung. Applicants respectfully disagree.

Cheung does not recognize temperature as a result-effective variable in achieving low nitrogen concentration at the surface in its capping layer or hardmask (silicon-oxide based film), and thus the Office Action has failed to establish that the claims are *prima facie* obvious over Cheung. The claimed reaction temperature range in claims 1 and 5 cannot properly be considered mere optimization of the temperature range at least because Cheung does not recognize temperature as a result-effective variable in achieving lower nitrogen content at the surface. The Office Action argues on page 3 with respect to Cheung that it would have been obvious to include a temperature of over 400 °C, “since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art.” The MPEP states, however:

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antoine*, 559 F.2d 618 195 USPQ 6 (CCPA 1977). See MPEP 2144.05IIB.

Cheung nowhere discloses or suggests that the temperature affects the nitrogen incorporation at the surface in his capping layer or hardmask. Thus, the Office Action citation to *In re Aller* is inapposite in light of the lack of disclosure of an effect on the nitrogen incorporation based on temperature.

Because the Office Action has failed to establish a *prima facie* case of obviousness, applicants have no burden to show unexpected results in rebuttal. Nevertheless, applicants point to the present specification in Tables 1 and 2, as showing unexpected results. As shown in these Tables, silicon-oxide-based films formed at respective temperatures of 300 °C, 350 °C, and 400 °C using SiH₄ and N₂O as material gases has a higher nitrogen content at the surface of the film as compared to films formed at reaction temperatures of over 400 °C (as recited in the claims. Thus, the presently claimed invention provides a silicon-oxide-based film with an unexpectedly lower nitrogen content at the surface.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date September 28, 2004

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